OPERATING INSTRUCTIONS
DELUXE LABORATORY CHART RECORDER
Model 500

MP MASTER
MA29148

Linear

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OPERATING INSTRUCTIONS
DELUXE LABORATORY CHART RECORDER
Model 500

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INTRODUCTION

The DC analog recorder is an application of advanced electronic techniques. Its solid state modular circuitry yields high performance and reliability.

This graphic recorder may be used in many different applications in the medical, teaching, and industrial fields where a precision instrument is of utmost importance.

Measurement of DC voltage, current, temperature, and a variety of other variables are made possible with the use of the recorder.

INITIAL INSPECTION

Your recorder is warranted to be free of defects in both workmanship and materials under normal use for a period of 12 months from the date of shipment.

Linear Instruments Corporation assumes no liability for services performed by anyone other than an authorized service representative.

The recorder should be inspected for shipping damage immediately upon its receipt. If any damage is found, please notify the carrier and the Customer Service Department at Linear.

If the recorder fails to operate properly, check all connections, cables and fuses. Insure that all plug-in boards are firmly seated in place. Double check for "pilot error" before calling the factory direct or the local dealer from whom the instrument was purchased.

Please save packing material until satisfactory recorder operation is confirmed.

SPECIFICATIONS

GENERAL

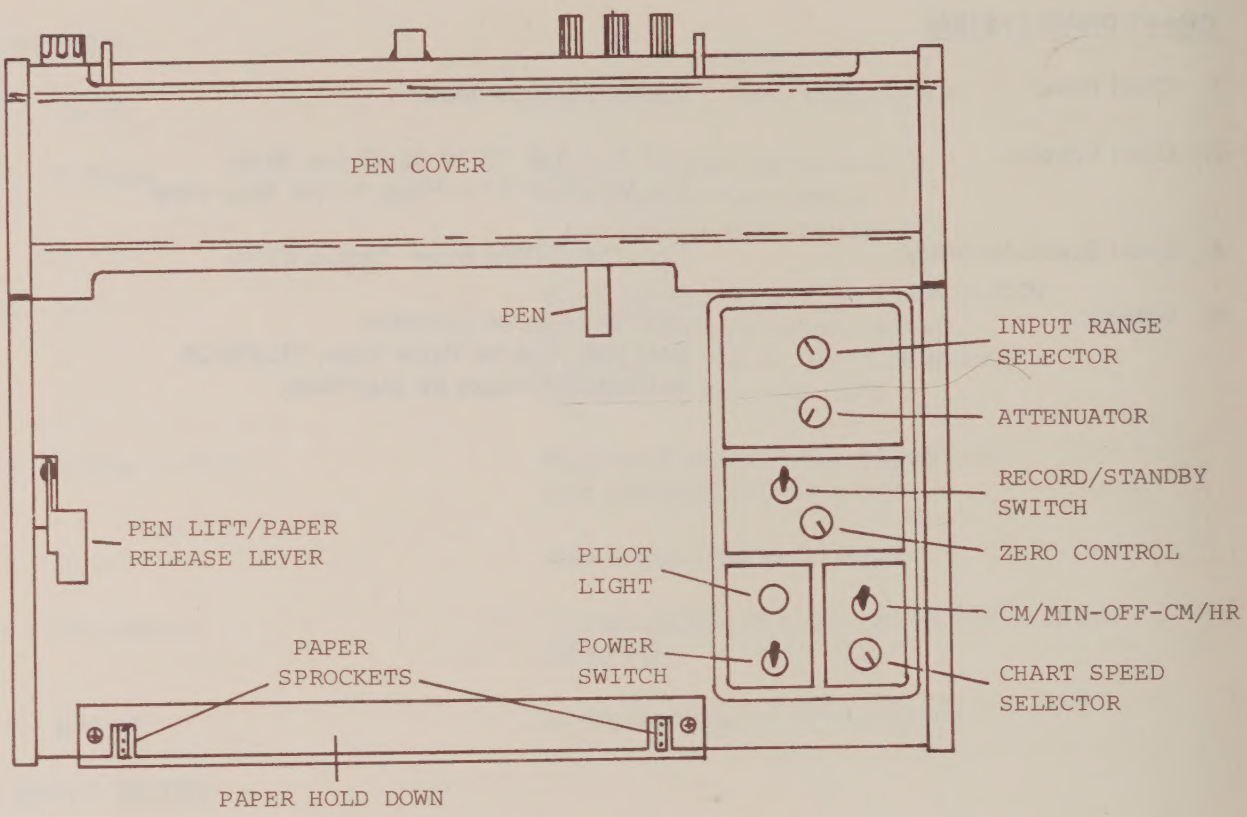
1.	Power:	115/230 VAC ± 10%, 50/60 Hz, 1 Ø.
2.	Wattage:	Single Channel 21W nominal Dual Channel 29W nominal Triple Channel 38W nominal
3.	Fuse:	3 AG Slo-Blo, 0.6 @ 115V; 0.15 A @ 230V (Single and Dual channel models) 3 AG Slo-Blo, 0.6 @ 115V; 0.3A @ 230V (Triple channel models only)
4.	Writing Method:	Pens are disposable fiber tipped units with self-contained ink supply.
5.	Chart:	250mm width; 30 meter length.
6.	Dimensions:	14.3 cm (5.625″) H × 45.7 cm (18″) W × 35 cm (13.75″) D
7.	Weight:	5.7 Kg (12.5 lbs.) to 7.25 Kg (16 lbs.)

SERVO SYSTEM

1.	Span-Full Scale	1mV, 2mV, 5mV, 10mV, 20mV, 50mV, 100mV, 500mV, 1 V, 2 V and 5 V (10 mV through 50 V with uncalibrated 10:1 attenuator) Model 555, 585, 595. lmV/10mV (100mV w/uncal 10:1 attenuator) Model 561, 591.
2.	Input Type:	Floating (± 100 V single ended.)
3.	Input Impedance:	20 Megohms through 100 mV, 2.5 Megohms through 5 volts.
4	Pen Response:	Greater than 70cm/sec.
5.	Damping:	Critically damped on all ranges (requires no adjustment).
6.	Accuracy:	Linearity ± 0.5% Deadband ± 0.1% Repeatibility ± 0.1%
7.	Zero Adjust:	Continuously adjustable from − 100% to + 100% (full scale +100% supression) on each range. Right hand zero is standard.
8.	Common Mode Rejection:	80 db minimum DC to 60 Hz 100 Volts maximum

CHART DRIVE SYSTEM

1.	Chart Drive:	2 Phase Stepper Motor
2.	Chart Speeds:	1, 2, 3, 4, 5, 6, 10, 12, 15, 20 and 30 cm Per Minute and Per Hour, Switch Selectable
3.	Chart Speed Accuracy:	Less than 0.03% Error - Typical 0.02%
4.	Control:	Internal - Crystal Oscillator External - Remote Pulse Train, TTL/CMOS or Contact Closure for Start/Stop.



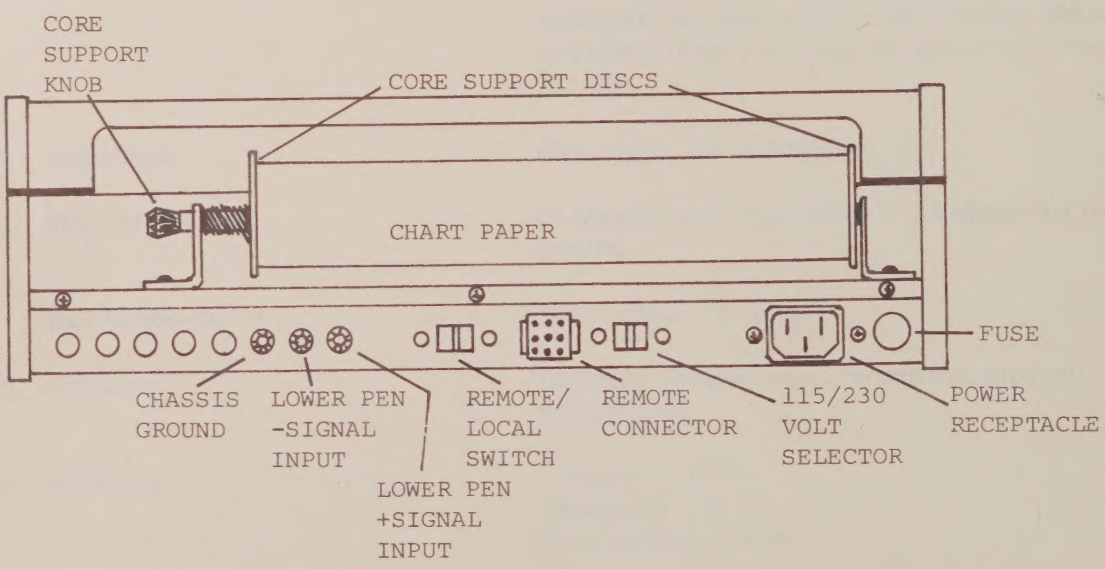


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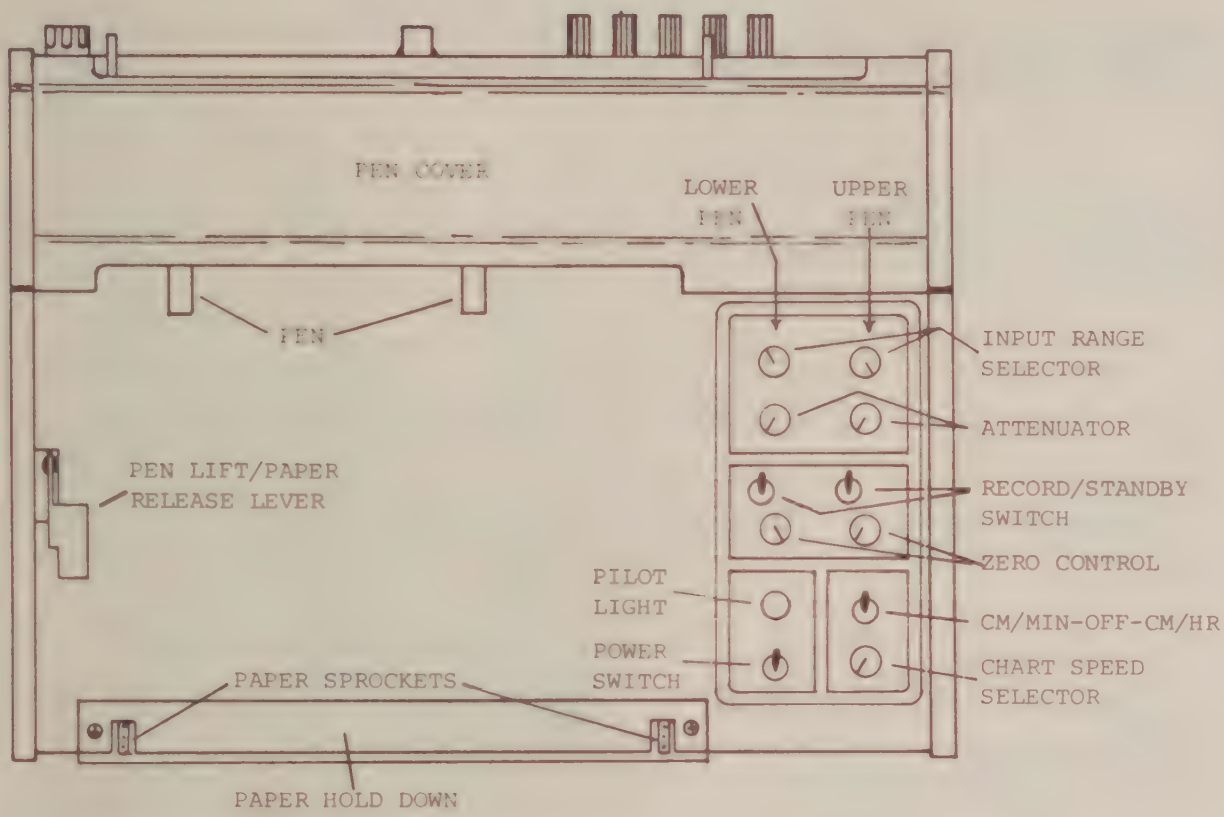
FIGURE 1 - SINGLE CHANNEL INPUT/CONTROL LOCATION



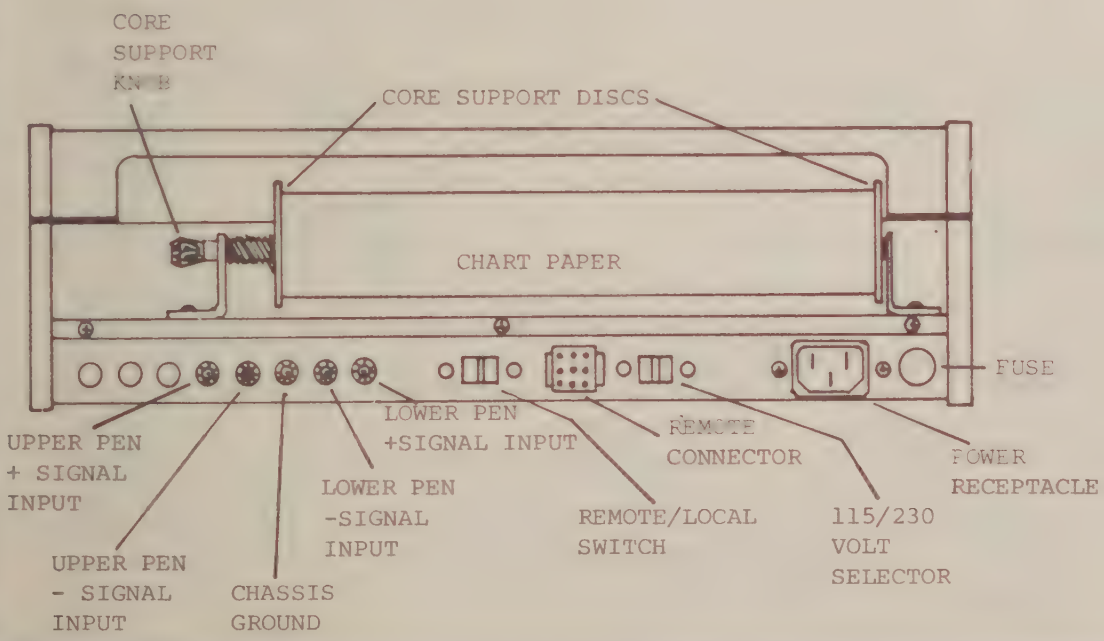


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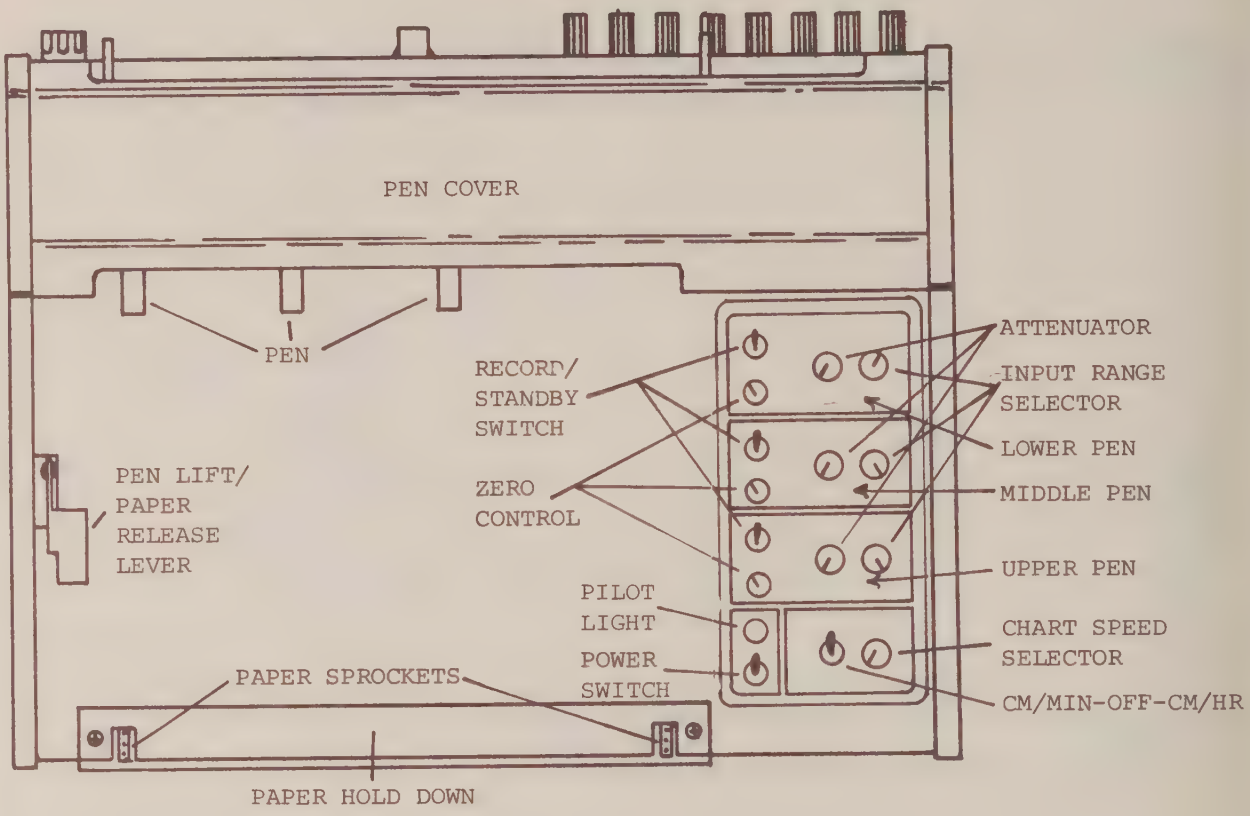
FIGURE 2 - DUAL CHANNEL INPUT/CONTROL LOCATION



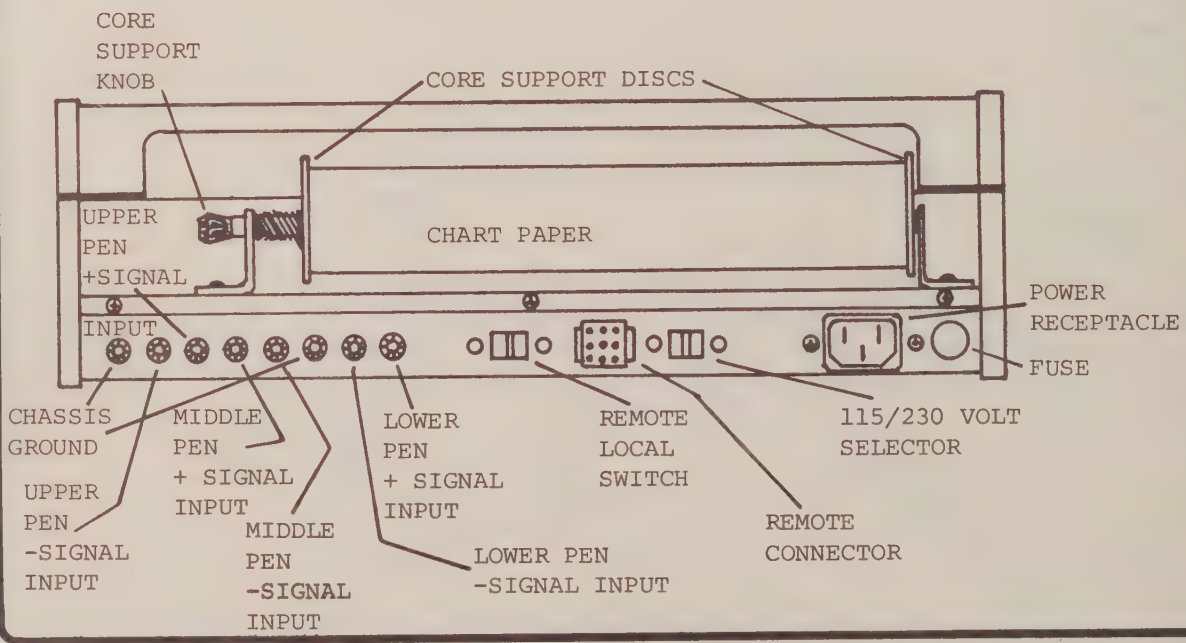


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FIGURE 3 - THREE CHANNEL INPUT/CONTROL LOCATION

SET UP PROCEDURES

The procedures, detailed in the following paragraphs, must be performed to prepare the recorder for operation.

FUSE REQUIREMENTS

Check unit for proper fuse, located on back panel of recorder. Units are shipped on 60 Hz position with a 0.3A fuse installed. For 230V 50 Hz operation a 0.15A fuse should be used (included with your recorder). For three channel instruments a 0.6A fuse for 115V operation and a 0.3A fuse for 230V operation is required.

CHART PAPER INSTALLATION

1. Remove masking tape from new roll of chart paper and cut or tear each side to form a blunt point at the center. (DO NOT FOLD).

2. Pull the knob on the right side of the chart paper core support, located on the rear panel of the recorder. Install paper, making sure it seats evenly on the two core supports. Release knob.

3. Lift the pen lift lever (on the left side of the instrument) to the full upright position.

4. Manually feed the pointed paper under the pen cover and across the writing area.

5. Pull the paper under the paper hold down and across the paper sprockets, making sure the holes in the paper sit evenly on the sprockets.

6. The paper is now loaded for operation.

PAPER RELEASE SYSTEM

Your recorder is equipped with a sprocket release that enables you to advance or rewind the paper manually.

To advance or rewind the paper manually:

Lift the pen lift lever to the full UP position.
The paper may now be moved forward or backward as desired.

To re-engage chart drive:

Return pen lift lever to the full DOWN position.

NOTE: After manual advancement or rewind there may be a short delay, depending on chart speed selected, then the chart will run at the selected speed.

PEN INSTALLATION

1. Remove the pen cap and store it where it can easily be found. Pens can be left uncapped for long periods of time, but greater pen life results from capping when not in use.

2. Slide the pen into the pen carriage and gently push back until the nib is firmly seated against the carriage.

3. Return the pen lift lever to the original down position.

POWER REQUIREMENTS

Your recorder is designed to operate on 115 or 230 VAC, 50/60 Hz, 10.

IMPORTANT:

Be sure to set the conversion slide switch, located on the back panel, to match the correct line voltage.

GROUNDING

For best performance, the green (or green and yellow) ground wire in the power cord for the recorder and the signal source should share a common water pipe ground. The green (green and yellow) wire in the power cord, is connected to the recorder ground (chassis), but not to the signal input. If the signal input does not have a third wire in its power cord, or if the instrument is not grounded, connect a wire between the recorder ground (green terminal) and the chassis of the signal source.

In case of large common-mode signals, particularly 120 Hz, connect the recorder ground (green terminal) to the source of the common-mode signal, or to the negative recorder input (black terminal).

INPUT SIGNAL CONNECTIONS

This instrument requires a DC voltage input. Signal sources with current outputs will require a shunt resistor across the + (red) and − (black) inputs. Ohms law may be used to compute the proper value for a given input range. The formula is:

$$R = \frac{E}{I}$$

Where E is the recorder span range selected in volts.
I is the maximum current signal to be recorded in amps.
R is the resistance of the shunt resistor in Ohms.

Electrical connections are made as follows:

Signal source positive to recorder Red (+) terminal.
Signal source negative to recorder Black (−) terminal.

Right hand chart zero is standard on the recorder. Positive going signals drive pen to the left. If an opposite presentation is desired, reverse the input leads and use the zero adjust control to position the pen to the opposite side of the chart. Negative signals will now drive the pen to the right.

NOTE: This unit is calibrated for right hand zero. Reversal of the input leads may yeild a ± 3% full scale error.

RECORDING PROCEDURE

With chart paper and pen(s) installed and recorder plugged into proper AC source (corresponding to the conversion slide switch on the back of the recorder) perform the following steps for routine recording.

1. Turn power switch on and chart switch off.

2. Set input span to desired range and attenuator to Cal position.

3. Set record/stand-by switch to stand-by position.

4. Zero pen to right side of chart using zero control knob.

5. Set record/stand-by switch to "REC" position.

6. Adjust input span and attenuator for desired full scale range to best display input signal.

7. Turn chart drive on and set chart speed as desired. Make sure the chart paper holes are properly aligned with sprocket teeth.

8. REMOTE CHART CONTROL

   Place the Remote-Local side switch in the "Remote" position. To start the chart drive from a remote location, apply a contact closure between pins 5 and 6 of the remote control connector located on rear panel of recorder. The chart will stop when the contact is opened.

NOTE 1: When switching from one sensitivity range to another, it may be necessary to rezero the pen. To do so, place REC/STBY switch in "STBY" readjust the zero knob. (The zero control has no stops at the end of mechanical travel.) Return REC/STBY switch to "REC".

NOTE 2: In most models the input resistance is so high that the pen may drift when no connections are present at the input.

NOTE 3: If the pen is physically stalled on the chart for a few seconds, the servo system will shut down to protect the motor. The best way to reset the system is to turn the recorder off for about 5 seconds, and then back on. Pen should reactivate and continue to record normally.

If the shutdown resulted from an overrange, the recorder will operate normally as soon as the input signal decreases to a level which is within the selected span range.

GENERAL THEORY

The DC input signal to the recorder is first filtered, then amplified by the preamp to a level which is less susceptible to noise and interference. This conditioned signal is then applied to the servo amplifier which continuously compares it to the feedback signal developed by the servo potentiometer.

The difference between these two signals is a positive or negative error signal that is amplified and used to drive the servo motor, which is coupled to the servo potentiometer, in a direction as to reduce the error signal to zero. Since the recorder pen is mechanically coupled to the servo motor and servo potentiometer, its position on the chart represents an accurate and continuous permanent graphic record of the input signal (see Figure 4).

DC POWER SUPPLY

AC line voltage is reduced by stepdown transformers and converted to DC by solid state rectifiers and regulators. A stable DC voltage, generated by a compensated zener diode, is used as a reference for the servo pot.

PEN DRIVE SYSTEM

A DC servo motor is used to control the servo pot and recorder pen by means of a gear driven servo drum assembly. The pen is attached to a drive cable which is wrapped around and secured to the drum. As the drum rotates, the pen is moved across the chart proportionate to the amount of drum rotation.

This recorder uses Linear's patented pulse modulated servo to achieve greater accuracy, linearity, and less deadband than conventionally driven recorders (U.S. Patent No. 4,146,828).

CHART DRIVE SYSTEM

In this simple, reliable system an internal crystal oscillator generates pulses which are divided down by integrated circuit logic. The chart speed switch merely selects the appropriate pulse rate to drive the stepper motor at the desired speed. (The crystal frequency is not a function of line frequency, therefore chart speeds are completely independent.)

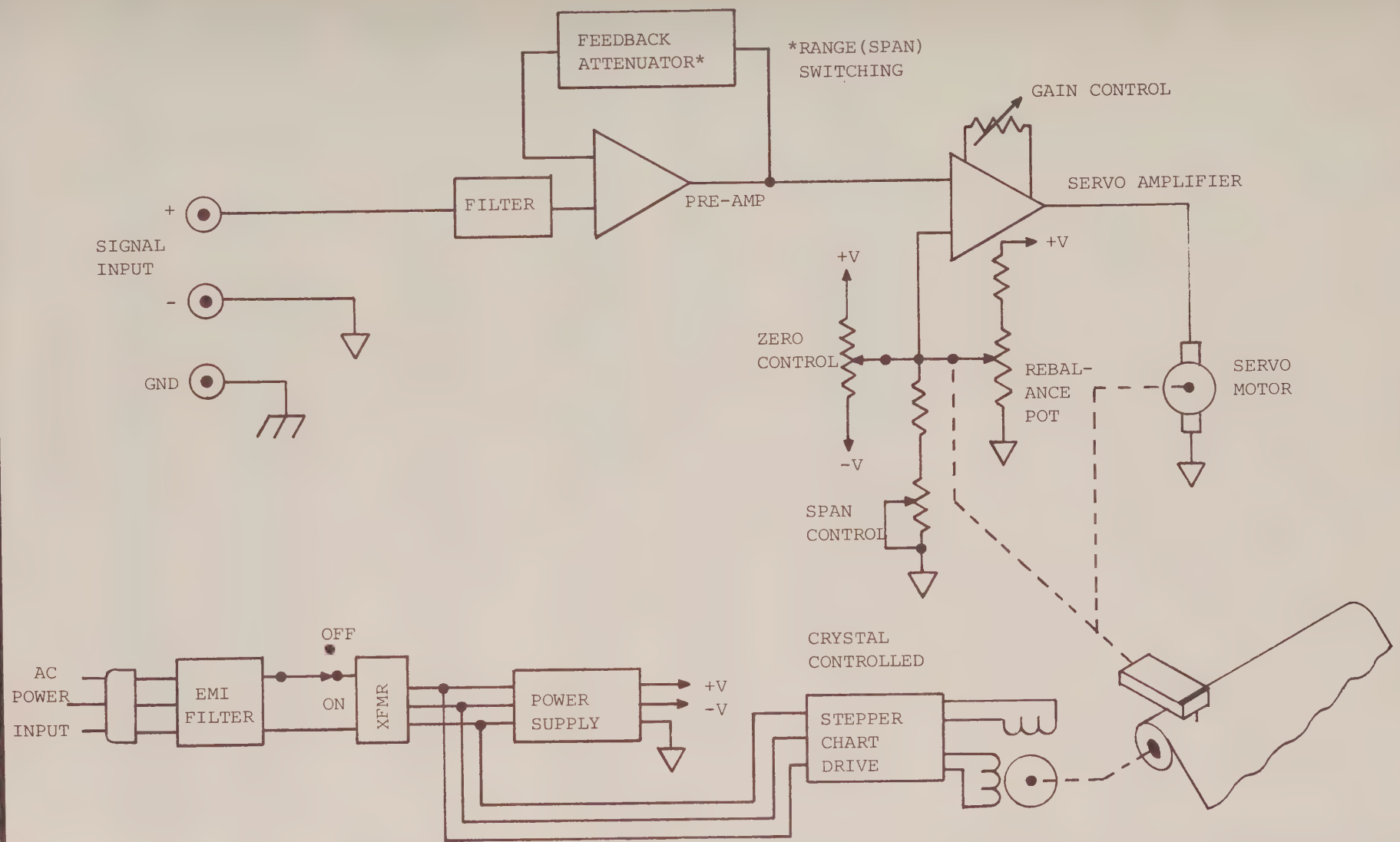

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FIGURE 4

BASIC RECORDER BLOCK DIAGRAM

CALIBRATION

This recorder is designed to be simple, reliable, easy to maintain and repair. Therefore, the procedures presented here will be as simple, clear and brief as possible. For special problems, we recommend that you contact your local representative or the factory service department.

POWER SUPPLY

There are no calibration adjustments in the power supply. Barring failure, the reference voltages will remain constant and stable.

CHART DRIVE SYSTEM

The stepper drive printed circuit board has no calibration adjustments. Barring failure or gear binding, the stepper drive printed circuit board and stepper motor should give many years of reliable service. If a problem should arise, consult your local representative or factory service department.

PEN DRIVE SYSTEM

The calibrations covered in this section should be performed by a qualified technician. The technician must have knowledge of working around voltages which may cause an electrical shock.

NOTE: Gain, offset and span must be adjusted for each channel in multi-pen units.

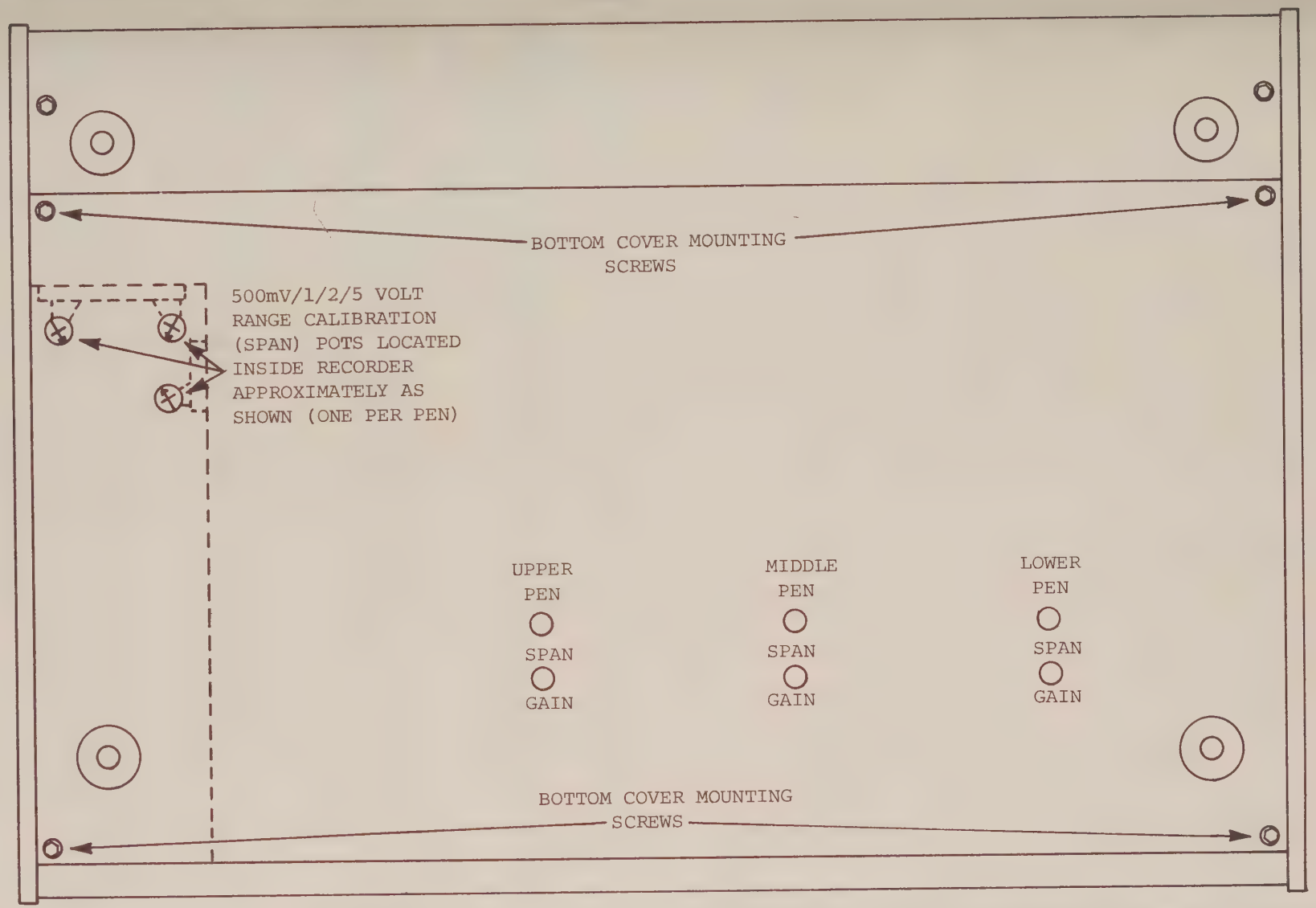

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FIGURE 5 - BOTTOM COVER MOUNTING SCREW & GAIN/SPAN CONTROL ACCESS LOCATION

PRE-AMPLIFIER PCB ASSEMBLY 9801-0007

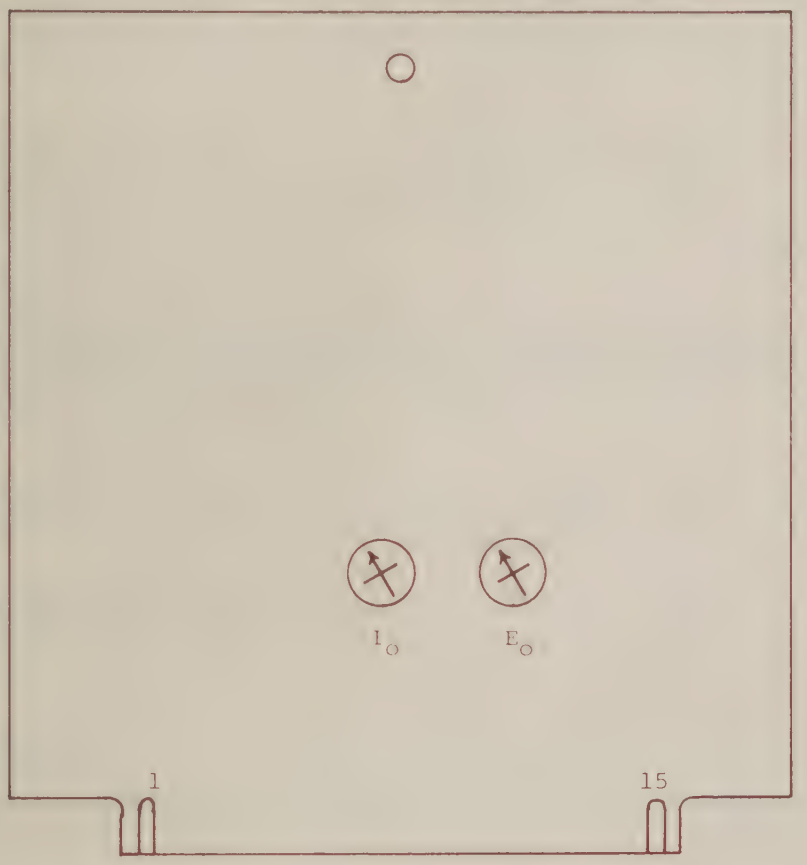


FIGURE 6 OFFSET ADJUSTMENT LOCATION

1. Gain (See Figure 5)

The gain adjustment controls the servo loop gain or "dead band" of the recorder. This can be reached through a hole in the bottom of the recorder marked GAIN. If set too high, the pen will "buzz". If set too low, the pen will be sluggish.

To Calibrate:

A. Short (+) and (−) inputs, (red and black connectors on back of recorder) and set pen to center scale by turning the zero control.

B. Adjust gain control clockwise until pen "buzzes", then back off counterclockwise until buzzing stops.

C. Recheck the adjustment by moving the pen over full scale using the zero control. If pen "buzzes" at any point, turn gain control counterclockwise until the "buzzing" just stops.

2. Offset (See Figure 6)

This adjustment reduces the zero shift between input spans to a minimum value. Performance of this adjustment requires the recorder input to be switched between a short circuit and a 50K ohm resistor. Connect a 50K ohm resistor across the recorders input binding posts (+ and −).

To Calibrate:

2.1 Recorders with push-button zero switch

A. Allow the recorder to warm up to operating temperature (30 minutes is suggested).

B. Remove the bottom panel of the recorder.

C. Connect a short across the input binding posts.

D. Place the range (span) switch in the 100mV setting (10mV setting on 2 range instruments).

E. Use the zero adjust knob to set the pen to mid-scale.

F. Switch the range switch to the 1mV position.

G. Return the pen to the setting in step "E" with the E_o potentiometer in the pre-amp circuit.

H. Remove the short which was connected in step "C".

I. Return the pen to the setting in step "E" with the I_o potentiometer in the pre-amp circuit.

J. These adjustments are interactive so it will be necessary to repeat steps "C" through "I" until minimum pen movement is achieved.

K. Remove the 50K resistor.

2.2 Recorders with REC/STBY switch

A. Allow the recorder to warm up to operating temperature (30 minutes is suggested).

B. Remove the bottom panel of the recorder.

C. Place the REC/STBY switch in STBY.

D. Place the range (span) switch in the 100mV setting (10mV setting on 2 range instruments).

E. Use the zero adjust knob to set the pen to mid-scale.

F. Switch the range switch to the 1mV position.

G. Return the pen to the setting in step "E" with the E_o potentiometer in the pre-amp circuit.

H. Place the REC/STBY switch in REC.

I. Return the pen to the setting in step "E" with the I_o potentiometer in the pre-amp circuit.

J. These adjustments are interactive so it will be necessary to repeat steps "C" through "I" until minimum pen movement is achieved.

K. Remove the 50K resistor.

3. Span (See Figure 5)

This enables the technician to adjust the recorder so that a calibrated full scale input signal will move the pen up to the full width of the chart. The first span adjustment can be reached through a hole in the bottom of the recorder marked SPAN. The second span adjustment is normally not necessary and the bottom panel must be removed to gain access to this adjustment.

To Calibrate:

A. Allow recorder to warm up to operating temperature (30 minutes is suggested).

B. Set recorder in 1mV position and signal source to zero output.

C. Carefully set pen to zero by turning zero control.

D. Apply a 0.1% accuracy 1mV DC signal to the input.

E. Insert a screwdriver in the hole in bottom of recorder marked SPAN. Move adjustment until pen is at 100% position.

F. Check all input spans with proper inputs for 100% ± 0.5% deflection. Check zero for all ranges and reset as necessary.

NOTE: If spans for ranges from 200mV through 5V DO NOT deflect 100% ± 0.5% continue with the following steps:

G. Remove the bottom panel and set the range (span) switch to the 1V position. Check zero and reset as necessary.

H. Apply a 1V 0.1% accuracy DC signal to the input.

I. Adjust the potentiometer located on the 4 lug terminal strip near range switch (on the inside of recorder) for 100% ± 0.5% pen deflection.

J. Check all inputs from 200mV to 5V with proper inputs for 100% ± 0.5% deflection. Check zero for all ranges and reset as necessary.

NOTE: For models 561/591 steps G through J are not applicable.

There are no additional calibration points on the recorder.

SPECIAL FEATURES

MECHANICAL EVENT MARKER - OPTION 11 (*)

The mechanical event marker uses a separate, solenoid actuated pen assembly to provide a short mark at the left edge of the chart when a contact closure is made between the appropriate pins of the remote control connector. (See note ##).

NOTE: This special feature is not available on three pen models.

OVERRIDE EVENT MARKER - OPTION 16 (***)

The override event marker produces a "glitch" in the analog pen trace when a contact closure is made between the appropriate pins of the remote control connector. (See note ##).

NOTE ## - Option 11 and Option 16 Remote Control Connector pin connections:

1. On recorders with Option 16 standard (Manufacture date 1 July 1979 or later), this option will be wired to pins 1 and 2.

2. If a second Option 16, or an Option 11, is added in addition to the standard Option 16, it will be wired to pins 3 and 4.

3. If an Option 11 is installed in place of the standard Option 16, it will be wired to pins 1 and 2.

4. If two Option 16 and one Option 11, or three Option 16, are installed, then Option 13 (Electric Pen Lift) is not available and the third event marker will be wired to pins 8 and 9.

REMOTE CHART CONTROL - OPTION 12 (**)

The remote chart control provides the ability to turn the chart drive on and off from a remote location when a contact closure is made between pins 5 and 6 of the remote control connector. (The Remote-Local side switch, located on the rear of the recorder, must be in the "Remote" position.)

ELECTRIC PEN LIFT - OPTION 13 (*)

The electric pen lift provides a means by which the recorder pen(s) may be lifted off the chart, by an internal solenoid, when a contact closure is made between pins 8 and 9 of the remote control connector (See note ##-4).

PAPER RELEASE CLUTCH (**)

Your recorder is equipped with a sprocket release that enables you to advance or rewind the paper manually.

To operate the sprocket release:

Lift the pen lever to the full UP position. The paper may now be moved forward or backward as desired.

To re-engage the chart drive:

Return the pen lift lever to the full DOWN position.

NOTE: After manual advancement or rewind there may be some delay, depending on the chart speed selected, until the gears re-engage, then the chart will run at the selected speed.

REMOTE CHART PROGRAMMING/TTL (**)

The recorder chart drive system is designed to operate from an external frequency source (including TTL levels). The chart can be run at time rates other than those built into the recorder. This mode is obtained by placing the Remote-Local slide switch, on the rear panel of the recorder, in the "Remote" position, and applying a pulse train, with the following characteristics, to pins 6 and 7 of the remote control connector, pin 7 being common.

PULSE TRAIN SPECIFICATIONS:

0/LOW state voltage +0.5V or less

1/HIGH state voltage +3V to 10V maximum

Minimum pulse width: 100 microseconds

Pulse frequencies up to 10KHz may be used, providing the chart speed selector is set to limit actual chart movement to 50 cm/min or less. A 50 cm/min paper speed can be obtained by applying a 250 HZ external frequency and setting the chart selector switch in the 30 cm/min position.

The formula is Chart Speed $= \frac{F}{150}$ Hz $\times$ S

Where : F = external frequency in Hz
S = selected chart speed

When the external frequency is set to 150 Hz, the chart drive will run at the speeds marked on the top panel selector switch.

EXAMPLE: The selector switch is set at 30 cm/min and the external frequency is changed to 165 HZ (a 10% increase). The chart will now run at 33 cm/min.

**Standard on all model 500 recorders.

NOTE: Changes of external frequency affects all selector speeds by the same factor.

The recommended maximum chart speed for start-stop operation is 50 cm/min. If the frequency is "swept" (no start-stop), it is possible to run faster than 50 cm/min; however, sweep rates must be gradual enough to assure accurate mechanical tracking.

(*) Available at extra cost.

(**) Standard on all Model 500 Recorders.

(***) Standard on Channel 1 (Lower Pen) of all Model 500 Recorders. Available at extra cost on additional channels.

OPERATIONAL TIPS AND MAINTENANCE

Chart paper and pens have been carefully matched for optimum writing and minimum "bleed". Substitutions could cause improper writing. Keep pen tips covered when not in use to prolong writing life.

NOTE: If the pen is left uncapped for long periods and dries out, it may be revitalized by dipping in water for a few seconds.

Do not press down or otherwise manually force the paper hold down bracket. This could cause pinching of the paper as it feeds over the sprockets. Firm tension on paper roll and correct alignment of the paper hold down bracket are required for proper chart paper feed.

Allow recorder to warm up for about 30 minutes if high accuracy/stability recording is desired.

The exterior surfaces of the recorder should be cleaned periodically by wiping with a soft damp cloth. Water may be used to remove ink, etc.; however, solvents should not be used as they may damage or destroy the finish.

TROUBLESHOOTING

The modularity and simplicity of this recorder make it possible to isolate the problem area in many cases. Once you have done this, a quick call to your local representative or dealer office, will bring you needed advice or replacement part.

While it is impossible to think of every problem possibility, the following chart will give you suggestions on how to solve the most common recorder problems.

ANALOG SECTION

SYMPTOM	PROBABLE CAUSE	REMEDY
Pilot light does not light, and recorder is inactive.	1. AC power source disconnected.	1. Connect AC power source.
	2. Fuse blown.	2. Replace fuse.
	3. Conversion slide switch in wrong position.	3. Check slide switch on rear panel.
Pilot light on, but recorder inactive.	1. Signal input leads disconnected.	1. Check input connections.
	2. Preamp/servo driver circuit board loose in connector.	2. Check circuit board installation.
	3. Gain set too low.	3. Adjust gain control through hole in bottom of recorder.
	4. Defective preamp/servo driver circuit board.	4. Replace preamp/servo driver circuit board.
	5. Defective servo motor.	5. Contact distributor or service rep.
Excessive deadband.	1. Gain set too low.	1. Adjust gain control hole in bottom of recorder.
	2. Excessive common mode signal.	2. Connect ground terminal to source of common mode signal.
	3. Recorder ground not connected to signal source ground.	3. Provide a common ground for third wire (green or green and yellow) in power cord.

ANALOG SECTION

SYMPTOM	PROBABLE CAUSE	REMEDY
	4. Pen drive cable too loose.	4. Contact distributor or service rep.
	5. Pen carriage dragging on slide rod.	5. Contact distributor or service rep.
Noise on pen trace.	1. Noisy input signal from signal source.	1. Check signal source.
	2. Extremely noisy power-line.	2. Check powerline.
	3. Gain set too high.	3. Adjust gain control through hole in bottom of recorder.
	4. Recorder ground not connected.	4. Provide a common ground for third wire (green or green and yellow) in power cord.
	5. Defective bearing in servo motor.	5. Contact distributor or service rep.
Pen trace has isolated steps.	1. Pen carriage slide rod dirty.	1. Contact distributor or service rep.
	2. Servo driver gain set too low.	2. Adjust gain control through hole in bottom of recorder.
	3. Defective servo motor.	3. Contact distributor or service rep.
	4. Defective servo pot.	4. Contact distributor or service rep.
Pens will stop moving but will catch up if physically pushed.	1. Defective bearing in servo motor.	1. Contact distributor or service rep.
Pen writes poorly.	1. Ink supply depleted.	1. Replace pen.
	2. Pen tip dried out.	2. Revitalize by dipping in water for a few seconds.

CHART DRIVE SECTION

SYMPTOM	PROBABLE CAUSE	REMEDY
Chart drive inoperative.	1. Loose or defective power connections.	1. Check power connections to stepper transformer.
	2. Defective chart drive motor.	2. Contact distributor or service rep.
	3. Defective stepper chart drive circuit board.	3. (A) Check AC power connections to circuit board. (B) Check DC voltages on circuit board.
	4. Gear train binding.	4. Contact distributor or service rep.
Continuous chart drive.	1. Defective Capacitor across chart on-off switch.	1. Replace capacitor.
No chart drive in a particular chart speed.	1. Loose or defective connections at chart speed selector and/or circuit board connector.	1. Check and repair connections.
	2. Defective component on circuit board.	2. Replace defective circuit board.

RETURN REQUESTS/INQUIRIES

Service inquiries and return requests should be made directly to Linear Instruments Corporation, or your authorized Linear dealer.

DO NOT return recorder for factory service without authorization from the Linear Service Department.

To avoid lengthy delays in processing orders or correspondence, please include the recorder model number and serial number.

Linear locations:

LINEAR INSTRUMENTS CORPORATION
17282 Eastman Avenue
Irvine, California 92714
Telephone: (714) 546-6776
(800) 854-8023
Toll Free Outside California
Telex: 685613

LINEAR INSTRUMENTS CORPORATION
190 Main Street
Hackensack, NJ 07601
Telephone: (201) 488-0080
(800) 526-4645
Toll Free Outside New Jersey
Telex: 642581

ACCESSORIES

500 SERIES

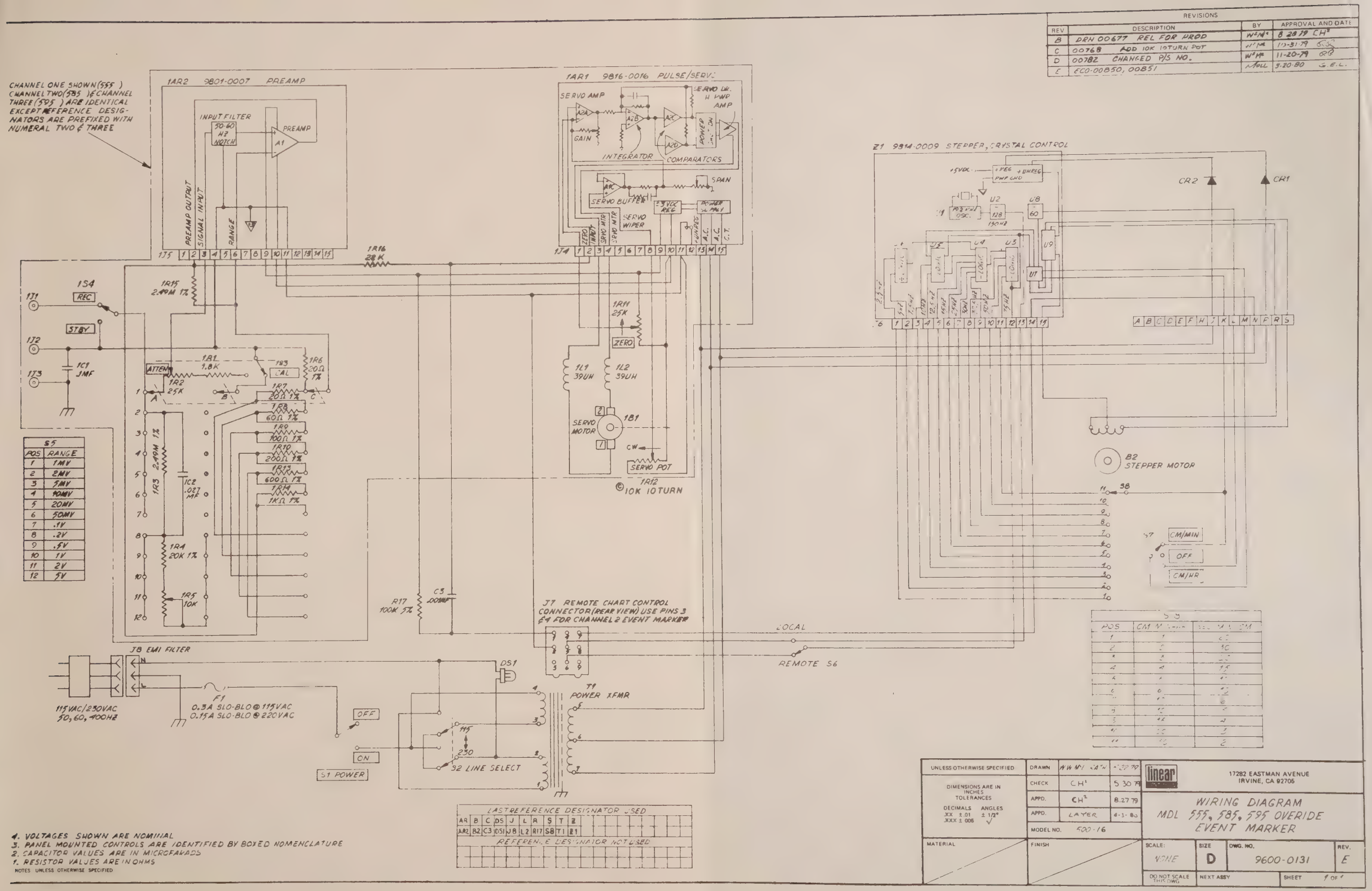
CHART PAPER	PART NUMBER
250 mm (10")	0100-0025
PENS	
For Single Pen Models	
Blue short nib	0100-0105
Red short nib	0100-0106
Black short nib	0100-0107
Green short nib	0100-0108
For Dual Overlap Models	
Blue short nib	0100-0105
Red short nib	0100-0106
Black short nib	0100-0107
Green short nib	0100-0108
Blue long nib	0100-0109
Red long nib	0100-0110
Black long nib	0100-0111
Green long nib	0100-0112
For Three Pen Models ONLY	
Blue short nib	0100-0105
Red short nib	0100-0106
Black medium nib (special)	0100-0131
Green long nib (special)	0100-0132

PARTS AND SUB-ASSEMBLIES

Servo PCB Assembly	9816-0016 (S/N 43599 & Later)
Servo PCB Assembly	9816-0011 (S/N 43598 & Before) (Interchangeable w/ 9816-0006
Chart Drive PCB Assembly	9814-0009
Pre-Amp PCB Assembly	9801-0007
Cord, Power, Plug-in (Domestic)	6040-0005
Cord, Power, Plug-in (European)	6040-0006
Fuse, 3AG, 0.6a Slo-Blo (595 only)	5120-0010
Fuse, 3AG, 0.l5a Slo-Blo	5120-0007
Fuse, 3AG, 0.3a Slo-Blo	5120-0006
Servo Potentiometer (Rebalance)	4750-0022 (S/N 43598 & Before)
	4750-0037 (S/N 43599 & After)
Motor, Chart Drive	3525-0010
Motor, Servo	3510-0008
Pin, Remote Connector (Male)	2850-0065
Pin, Remote Connector (Female)	2850-0064
Feet, Rubber, Adhesive	2850-0005
Knob, Control (Except 595 Zero)	2405-0016
Knob, Control (595 Zero only)	2405-0014
Button, Zero Switch	2405-0007

* IMPORTANT *

Always specify model number, options, and serial number when ordering replacement parts and sub-assemblies.



S5	
POS	RANGE
1	1MV
2	2MV
3	5MV
4	10MV
5	20MV
6	50MV
7	.1V
8	.2V
9	.5V
10	1V
11	2V
12	5V

S8		
POS	CM/MIN	SEC/MIN CM
1	1	[illegible]
2	2	30
3	3	[illegible]
4	4	15
5	5	[illegible]
6	6	[illegible]
7	7	6
8	8	5
9	9	4
10	10	3
11	11	2

LAST REFERENCE DESIGNATOR USED									
AR	B	C	DS	J	L	R	S	T	Z
AR2	B2	C3	DS1	J8	L2	R17	S8	T1	Z1
REFERENCE DESIGNATOR NOT USED									

4. VOLTAGES SHOWN ARE NOMINAL
3. PANEL MOUNTED CONTROLS ARE IDENTIFIED BY BOXED NOMENCLATURE
2. CAPACITOR VALUES ARE IN MICROFARADS
1. RESISTOR VALUES ARE IN OHMS

NOTES UNLESS OTHERWISE SPECIFIED

REVISIONS			
REV	DESCRIPTION	BY	APPROVAL AND DATE
B	DRN 00677 REL FOR PROD	W²M²	8 28 79 CH²
C	00768 ADD 10K 10TURN POT	W²M²	10-31-79 [illegible]
D	00782 CHANGED P/S NO.	W²M²	11-20-79 [illegible]
E	ECO-00850, 00851	MOLL	3-20-80 G.E.L.

UNLESS OTHERWISE SPECIFIED	DRAWN	W W M [illegible]	[illegible] 22 79
DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ± .01 .XXX ± .005 ANGLES ± 1/2° √	CHECK	CH²	5 30 79
	APPD.	CH²	8.27 79
	APPD.	LAYER	4-3-80
	MODEL NO.	500-16	
MATERIAL	FINISH		

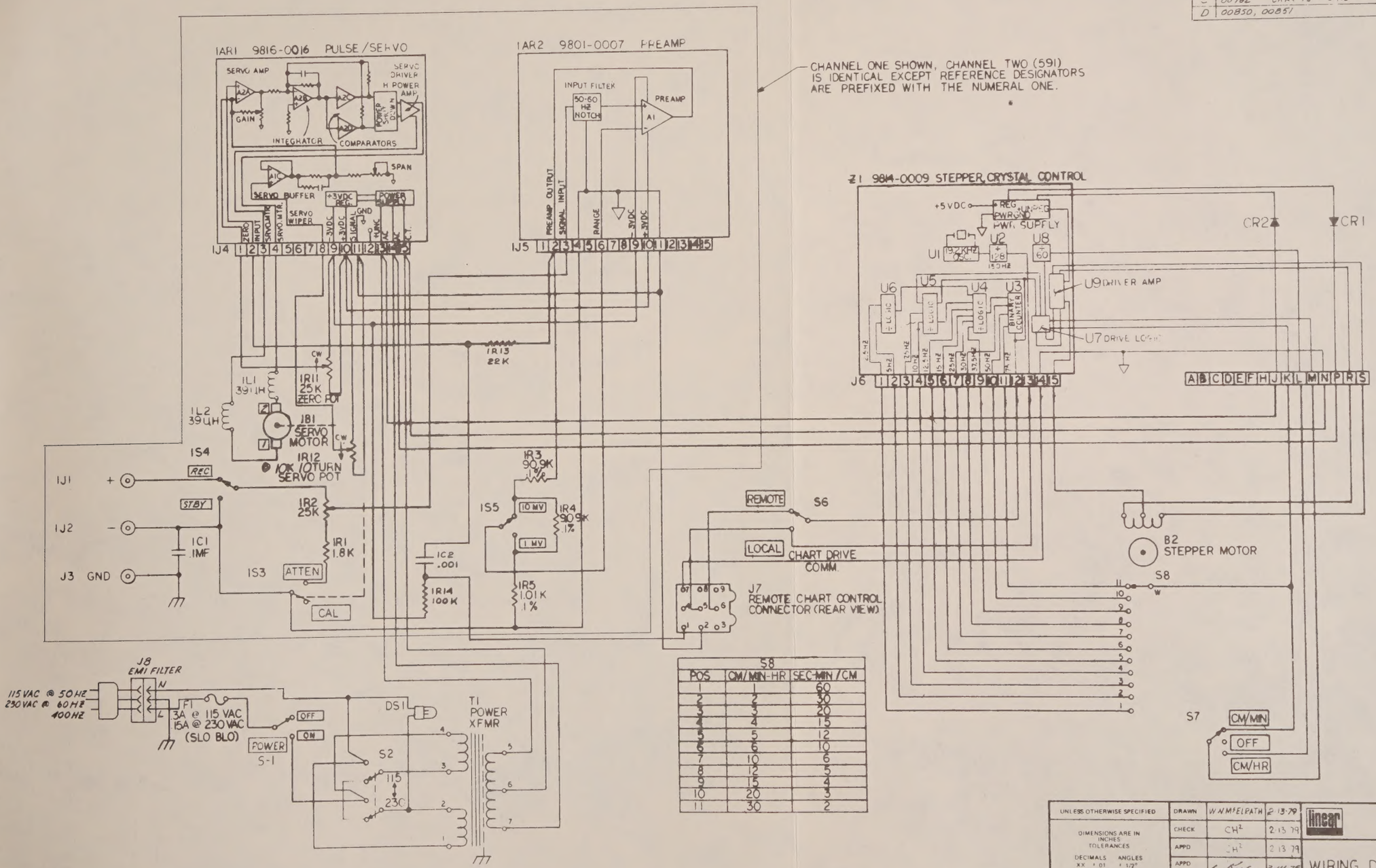
linear

17282 EASTMAN AVENUE
IRVINE, CA 92705

WIRING DIAGRAM
MDL 555, 585, 595 OVERIDE
EVENT MARKER

SCALE:	SIZE	DWG. NO.	REV.
NONE	D	9600-0131	E
DO NOT SCALE THIS DWG	NEXT ASSY	SHEET 1 OF 1	

REVISIONS			
REV	DESCRIPTION	BY	APPROVAL AND DATE
A	DRN 00671 REL FOR PROD	W²M²	2-15-79
B	00768 ADD 10K 10TURN POT	W²M²	10-31-79 RR
C	00782 CHANNEL P/S NO	W²M²	11-20-79 RR
D	00850, 00851	MOLL	3-20-80



S8		
POS	CM/MIN-HR	SEC-MIN/CM
1	1	60
2	2	30
3	3	20
4	4	15
5	5	12
6	6	10
7	10	6
8	12	5
9	15	4
10	20	3
11	30	2

4. VOLTAGES SHOWN ARE NOMINAL
3. PANEL MOUNTED CONTROLS ARE IDENTIFIED BY BOXED NOMENCLATURE
2. CAPACITOR VALUES ARE IN MICROFARADS
1. RESISTOR VALUES ARE IN OHMS

NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED	DRAWN	W.N.M.ELPATH	2-13-79
DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS XX ± .01 XXX ± .005 ANGLES ± 1/2°	CHECK	CH²	2-13-79
	APPD	CH²	2-13-79
	APPD	[signature]	2-14-79
	MODEL NO	561/591	
MATERIAL	FINISH		

linear — 17282 EASTMAN AVENUE, IRVINE, CA 92706

WIRING DIAGRAM, MDL., 561/591 W/ OPT 16

SCALE:	SIZE	DWG. NO.	REV
NONE	D	9600 - 013F	D

DO NOT SCALE THIS DWG — NEXT ASSY — SHEET 1 OF 1

Linear Instruments Corporation was founded March 31, 1971. The goal of the Company was to design, manufacture and market a precision, low-cost strip chart recorder capable of permanently recording virtually any type of electronic, biological, chemical, geological, ecological, medical or analytical phenomena.

At that time, the Company consisted of two principal stock holders and a small handful of employees. A 5-inch recorder was the Company's complete product line.

Since that time, the Company has experienced a continuous growth rate. Today, Linear Instruments Corporation occupies a modern facility in the Irvine Industrial Complex with floor space of 30,000 square feet and manufactures a product line consisting of more than 20 different recorders. In addition, Linear has a facility in Reno, Nevada devoted to Engineering, Research and Development and a Regional Sales/Service Office in Hackensack, New Jersey.

Linear recorders are sold worldwide through a system of distributors and independent sales representatives.

The low cost and high performance of Linear recorders has encouraged more than 70 major original equipment manufacturers (OEM's) to purchase our recorders and resell them under their own private brand name. In addition to the OEM's, thousands of independent customers also buy and use Linear recorders.

With the heavy demand for Linear recorders by OEM's and end users, Linear Instruments Corporation is still in the infancy of its growth.

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Irvine, California 92714
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190 Main Street, Suite 3D
Hackensack, New Jersey 07601
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Telex: 642581

MP MASTER
MA29148